

Fundamental Understanding of Highly Textured Hair through Technical Investigation and Social Listening for High Performance Solutions Aimed at Natural Textures and Straightened Textures

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P. Engerer, M.K. Crofoot, S. Marchioretto

Introduction:

Through its commitment to diversity and inclusion, Dow works to enable real and impactful change for consumers. The combined synergy of Dow's people, the deep scientific know-how and one of the broadest portfolios in the industry is helping to bring solutions to the underserved textured hair care market. In close collaboration with the Global African Affinity Network (GAAN) at Dow, the team was able to understand the barriers faced by consumers in the textured hair care industry and connect this market gap with the broader societal issues faced. GAAN highlighted the need to develop improved products to address key performance factors such as moisture, frizz control and shine. Shampoo, conditioners, styling products, but also scalp treatment, oil and serums were designed to cater to the unique needs of textured hair.



North America <ul style="list-style-type: none"> Looking for products to embrace natural hair Washes with dry scalp 2-3 hours or more to do hair Worried and frustrated to change my hair care for the sake of my hair Love natural products, but don't always get the performance I'm looking for 	Latin America <ul style="list-style-type: none"> No women in leadership wear their natural hair Wearing hair natural is a personal change I had to embrace myself to transform my hair into its natural style again 	Europe <ul style="list-style-type: none"> Products are not made for my hair Washing my hair increases frizz Washes are not gentle enough Washes are not effective 	Africa <ul style="list-style-type: none"> Not easy to find to be able to do hair or more so for hair Product straightens hair and is not gentle Conditioners are not effective Washes are not gentle enough Washes are not effective Washes are not gentle enough
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The highly textured hair market is an underserved market. The development team cycled through this process loop several times to achieve complete care formulations.

Results & Discussion:

Studying physicochemistry of highly textured hair, we see lipid layer compositional differences, higher cuticle packing, higher ellipticity, lower hair population density and increased porosity. This leads to decreased moisturisation perception, harsher feel, low hair manageability and reduced style retention compared to Caucasian Hair as summarized in Table 1.

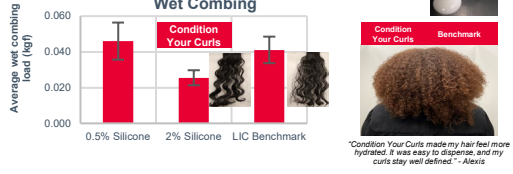
	Caucasian	African descent/highly textured
Ellipticity (aspect ratio)	1.4	1.9
Average diameter (um)	70	90 (with considerable variability along shaft)
Cuticle (number of layers and distribution vary)	The outside is 8-11 layers thick	Variable thickness with 6-10 layers at the end of the hair axis, reducing to 1-2 layers at the ends of the hair axis
Ortho and para-cortex content:	Straight is 100% para-cortex fibers and curly has a thin one-cell layer Ortho-cortex fibers at the periphery	Approximately equal amounts of the two types of fibers
Fiber area (m ²)	-1.20E-09	-8.02E-09
Fibers/m ² on the scalp	High	~40% of the Caucasian population density
Sebaceous glands on scalp	Many and active	Fewer and less active
Bound water in hair	High	5% lower than Caucasian
Lipid layer composition	Fatty acids^{C18}=hexadecyl^{C16}=heptadecyl^{C17}	Lacks fatty acids and more esters than Caucasian ~30% more "total" lipid than Caucasian (virgin African hair)
Trace elements (Copper from essential functional component, e.g., amino acids, keratin, melanin)	Bleached hair shows trace levels of sodium, copper and nickel and had the lowest levels of calcium	Below average levels of sulfur, higher levels of calcium and iron

Table 1: Unique physicochemical and structural properties of highly textured hair

Three formulations are highlighted. These were successfully tested by lab equipment and panelists.

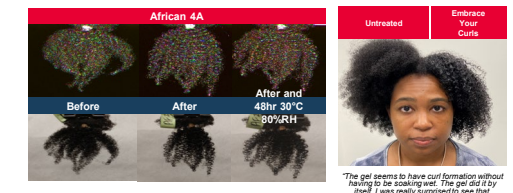
1. Condition Your Curls:

'All in one' rinse-off or leave-on conditioner



2. Embrace Your Curls

Multi-functional gel for high humidity hold, curl definition and ease of use.



3. Silky Royal Hair Butter

Creamy butter for curl definition and twisted styles



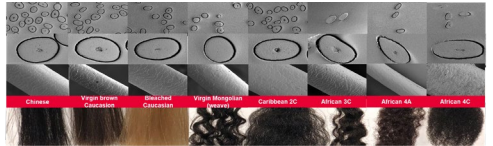
Materials & Methods:

Fundamental understanding of highly textured hair physicochemistry was first investigated. Test methods were designed and modified for type 3 and 4 hair types (Andre Walker Scale) [1]. Tresses were obtained from International Hair Importers or made in the lab from donated hair. In-vivo testing was performed on GAAN members.

- Test procedures used:**
- Diastron for Coefficient of Friction
 - Instron for Combing
 - Scanning Electron Microscopy (SEM)
 - Heat protection
 - Curl definition and retention in an Environmental Chamber
 - Fourier transform Infrared Spectroscopy
 - Bossa Nova RUMBA instrument to measure hair orientation for dark and highly textured hair
 - Corneometer for moisturization testing
 - Half-head or take-home in-vivo analysis

Differing Ethnicities, Curl Patterns and Textures

SEM evaluation of ellipticity, diameter, and cuticle packing



References:

[1]: "Andre Walker hair typing system - Women Health Info Blog". Women Health Info Blog. 2017-02-01. Retrieved 2018-04-25.

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Conclusions:

Through its commitment to diversity and inclusion, Dow worked to enable real and impactful change for consumers. The combined synergy of Dow's people, the deep scientific know-how and one of the broadest portfolios in the industry is helping to bring solutions to the underserved textured hair care market. In close collaboration with GAAN, the team was able to understand the barriers faced by consumers in the textured hair care industry and connect this market gap with the broader societal issues faced. The outcome was a set of 6 unique formulations specifically developed to provide superior benefits to highly textured hair via in vivo and in vitro technical testing.

